

ON THE  
NATURE, LOCALITY, AND OPTICAL PHENOMENA OF MUSCÆ VOLITANTES.

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DURING the last few years several essays have been published, both in this country and on the continent, with the view of explaining the causes and phenomena of the *muscæ volitantes*, and, in addition to this, almost every work treating of diseases of the eye, has devoted a separate chapter to the same subject. The mass of facts and of theories thus brought forward has been far from throwing much light on this interesting subject, almost all failing to demonstrate the truth of the theories they advance; and those who do demonstrate that which they describe depends on a particular structure existing in the eye, describe what is *not* a *musca volitans*, and has none of the characters belonging to that body.

Having paid no inconsiderable attention to this subject,—having, besides, had an opportunity of studying the complaint more than once in my own person, and having taken advantage of this circumstance to investigate fully its phenomena, causes, and locality, I have been enabled to arrive at conclusions which will explain every phenomenon, and render true *muscæ volitantes* capable of being at once distinguished from those fixed specks, nebulae, and the mottled indistinct vision of amaurosis and partial paralysis of the retina, which, even by the most eminent writers on this subject, have been mistaken for them.

As considerable confusion seems to exist, even in the writings of the very latest writers, as to what are *muscæ volitantes*, it is quite necessary that this be fully understood before we attempt an explanation of the phenomena, or assign their place in the visual-organ. It was from not attending to this that even Sir David Brewster appears to have described, as a *musca volitans*, one of those fixed specks in the eye which have been so often confused with and mistaken for the objects in question.

Of all the late writers M. Prevost in his learned essay printed in the “*Memoires de la Societ  Physique et d’Histoire Naturelle de Geneve*,” has given the most accurate and characteristic description of *muscæ volitantes*; laying down characters, which, if attended to, will serve to distinguish them from all other kinds of specks met with in vision. “On looking fixedly (says M. Prevost) at a point which is well illuminated, (the sky,) and taking the fixed point at

an elevation of  $30^{\circ}$  above the horizon, in a few seconds I see descend towards me, in the air, and over the object at which the eye is fixed, a kind of shower of pearls. This movement of descent is slow, so that half a minute or so elapses before the whole shower falls. After this I see nothing; but if the eye is, by a new effort, directed to a fixed point, the same objects seem to ascend instantaneously; but so instantaneously, that I rather fancy I see this than actually see it; immediately after this the objects begin to redescend as at first."\*

De la Hire, Le Roy, Demours, Donn , Bachelor, Sotteau, &c. all describe the general phenomena in somewhat similar terms, and all agree that the form of the bodies seen to move over the eye varies considerably, at one time being chiefly like strings of beads or of pearls or broken fragments, at others, globular bodies with dark centres and bright circumferences, or altogether of a dark colour, or altogether bright and luminous.

The writers in this country have confused these bodies with other and different objects to a much greater extent than their continental brethren; to such an extent, indeed, has this been the case, that of the numerous writers on diseases of the eye, the justly celebrated surgeons, Mr G. J. Guthrie and Mr Benjamin Travers, appear to be almost the only ones who distinguish the true *muscae volitantes* from the other objects with which they are so often confounded. As the later writers in this country, Mackenzie, Watson, Lawrence, Wardrop, &c. seem to have overlooked the distinctions laid down by these celebrated surgeons, we may be excused for quoting what they state.

Mr Guthrie shortly states that, "by *muscae volitantes* are understood a variety of appearances moving before the eyes, such as small threads or filaments assuming the form of worms, zig-zags, or spots of greater or lesser dimensions, but generally small; little globules or webs, or luminous spots sometimes surrounded by a halo, *which always move before the eye, and are never fixed*." "These spots always appear to sink below the axis of vision by their own weight when the eye is simply turned upwards."†

Mr Travers details the characters of the *muscae* at much greater length. "Muscae are either fixed, when they are usually allied to spectra, and belong to organic amaurosis; or floating, when they are, I believe, characteristic of functional amaurosis, sympathetic or proper. I have known the fixed *muscae* permanent without variation for years, darkening a certain defined portion of the field of vision. In some rare instances it precedes acute choroid inflammation; more frequently it is unconnected with any particular morbid state. Around the opaque spot persons have sufficiently distinct vision. The spot varies in density in different individuals, and under a long but gentle mercurial course, I have known it to become considerably less dense so as not to intercept bright light."‡

"The *musca volitans* is sometimes solitary, following the eye at

\* Memoirs, &c. 1832. Vol. v. p. 243.

† Lectures on the Operative Surgery of the Eye. London, 1823, p. 209.

‡ Synopsis of Diseases of the Eye. 3d. Ed. London, 1824, p. 178.

a fixed angle as it passes along a line; sometimes two, three, or more are presented; more frequently an immense assemblage *descending in a cloud as the eye is raised*, and ascending as it is depressed." He then describes their form as resembling drops of soot, or wings of insects, transparent vesicles, minute globules of quicksilver connected like links of a chain, short hairs with bulbs to them, minute globes, or as flat and annular, resembling coins. Mr Travers then continues "almost every person has at some time or other seen these appearances, but especially those subject to dyspepsia and disordered functions of the stomach and liver. At the moment of approaching deliquium they appear in one vast cloud; and they are the harbingers of the intense bilious headach." "I mention these opposite and transitory states of emptiness and plethora, concomitant with the *floating muscae*, to show the purely functional origin of the affection."\*

From the circumstance of the diagnostic mark of true *muscae volitantes* not being recognized, and their consequent confusion with fixed specks in the eye, or with the troubled mottled vision attendant on amaurosis, *muscae* have been usually regarded as one of the premonitory symptoms of cataract, glaucoma, amaurosis, &c. diseases which almost always lead to the loss of vision. The person, therefore, who is affected with these motes dancing before his eyes, and who consults a physician who is ignorant of the distinction between the *muscae volitantes* and the fixed specks (whether these fixed specks result from organic change in the structure of the clear parts of the eye or in consequence of certain spots of the retina becoming insensible to the stimulus of light), is apt to be kept in constant dread of losing his eyesight; and yet, until the true character of these motes is ascertained, he can have no certainty that such may not be the case.

The true *muscae volitantes* are not only met with in certain diseases of the eye, but are of pretty frequent occurrence in some fevers, and are very common in dyspeptics and hypochondriacs. In the fever patient they disappear as he recovers his health and strength; but in the dyspeptic they may become more or less habitual, and be attendant on him during a long life without ultimately leading to the destruction of vision, while they are capable of being removed at any time, on his being subjected to proper treatment.

Instead of detailing the symptoms and phenomena of this malady as I have seen it in others, I shall much more satisfactorily prove the conclusions at which I have arrived, by detailing my own case, as all the experiments and observations about to be detailed were made on myself; indeed, in no other way could I have arrived at so satisfactory an explanation of all the phenomena.

In April 1842, in consequence of continuing a severe course of study while labouring under influenza, and at the same time straining my eyes in microscopic pursuits, I was attacked with the phenomena of *muscae volitantes* to such an extent that the sight was quite obscured with the dark moving specks. As it was impossible

\* Synopsis of Diseases of the Eye. 3d Ed. London, 1824, p. 180.



to continue my researches in this condition, advantage was taken of the opportunity thus afforded to study the phenomena of the malady, and endeavour to ascertain its true cause.

The first and main point on which all the subsequent investigations must rest, was to determine whether the dark bodies really moved, or only appeared to do so in consequence of the movement of the eye causing the shade of the object to be projected on different parts of the sensitive retina. A large sheet of white paper was therefore fixed perpendicularly on the wall a few feet distant from where I sat, and one eye was directed to a spot marked in the centre of the sheet of paper. When this was done the whole paper was seen scattered over with dark specks varying in shape and size, but all *moving*. It was immediately remarked that the general direction of all the specks was *downwards*; that all appeared to be falling more or less slowly in a perpendicular direction; but at the same time, that very many, if not all, did not fall quite perpendicularly, but had a gentle inclination towards one angle. By examining the descent of these bodies in each eye alternately, it was ascertained that, when the left eye was used, the bodies tended to the right, and that when the right eye was used the bodies inclined in their descent towards the left hand; or, in other words, that the bodies deviated slightly from the perpendicular towards the inner canthus of the eye. This was an important fact, because it tended to prove that the bodies, whatever they were, were not floating in a fluid, for in that case their descent would have been perpendicular.

The next point to be ascertained was the extent of motion of the moving bodies. When the eye was directed to the fixed spot in the centre of the sheet of paper, or to the clear sky, either unaided or by looking at it through a fine aperture, as a pin hole in a plate of metal, or through a minute lens, it was distinctly observed that the *muscae moved over the whole visual aperture*; and that when the eye was kept steadily fixed, all the bodies gradually fell below the field of vision. On some occasions they took nearly a minute to do this, in others the descent was much more rapid, being completed in much less than half that time,—in both cases leaving the field of vision clear, provided the eyes were kept perfectly motionless.

The figure and colours of these objects next engaged the attention. It was immediately perceived that the figures of these moving bodies were very various, and, what was not a little singular, that the figure of each was more or less altered on each movement of the eye. The most common form in one state of the eyes was that of more or less regularly rounded or oval bodies, either scattered irregularly over the eye, or associated in small but variously sized masses, or united into broken irregular fragments of lines. Every motion of the eye caused these bodies to assume new shapes, but in the same state of the eye the general character of the bodies remained always more or less the same. When the eye in this state was directed to a white sheet of paper on the wall, or to the white wall itself, these bodies were seen of a dark colour, which gave them the appearance of particles of soot, of flies and midges, and of broken

particles of hair, or short tubes moving before the eyes. When the eye, however, was directed to the clear sky a very different appearance was presented. According to the clearness of the sky and the direction of the sun's light relative to the eye, these bodies appeared to be transparent or to have a slightly opalescent hue, or to consist of bodies with a clear centre surrounded by a bright halo, or with a dark centre and a luminous circumference, or they resembled little globules of glass, or drops of dew, or pearls, and when they were in short broken lines they resembled short strings of pearls, or of glass beads. In some particular lights each particle seemed a moving spark, so that the appearance presented to the eye was as if a shower of sparks, with irregular shaped particles of fire, danced before the eyes. All these varied appearances were seen at one and the same time by alternately directing the eye to different parts of the sky and wall. All evidently depended on the varying action of the rays of light on some material particles which were the undoubted cause of *muscae volitantes*.

In other states of the eye the appearance resembled irregular wavy or zigzag lines; but when these were minutely examined they were found to consist of the rounded particles above described, being thrown into strings or rows, in which state they often closely resembled fine transparent tubes, filled with globular bodies; and where several of the globular bodies were heaped together, gave the idea of the tubes being thrown into a knot at that point. Whenever this peculiar cobweb or reticular appearance, as it may be termed, (*visus reticulatus*) was observed, it was remarked that their motion was much slower than when the *muscae* consisted of irregular or rounded detached particles. In some cases, indeed, this was perfectly remarkable, the reticulations or lines scarcely seeming to move till the movement of the eye itself caused them to assume new arrangements. When, however, motion was observed among the lines, it was frequently remarked that one portion of a line would break off, and fall slowly as a detached particle, leaving the other portions to descend more slowly. This fact, which was very frequently observed, showed the correctness of the observation, that every one of these lines was made up of accidentally agglutinated particles,—a fact rendered still more evident to the senses by moving the eye, which had the effect of destroying completely the old arrangement of the particles, and throwing them into new, but still linear forms.

These lines, apparently according to the light admitted to the eye, presented all the varied colours above remarked, as being seen in the detached *muscae*. It is well worthy of remark, however, that this varied mode of examination, viz. by presenting the eye alternately to a bright and to a darker portion of the sky and wall, satisfactorily established the fact of all these apparent lines being composed of more or less globular or rounded particles, agglutinated laterally, and having little cohesion to each other. In a very bright light they resembled strings of pearls, or of glass beads, or little balls of fire arranged in strings. Sometimes the centre of each separate particle was dark, whilst the circumference was surrounded

with a bright halo; or it was strongly illuminated on one side, while the other was thrown into the shade; or it was bright like a spark in the centre, whilst a faint shade surrounded it. As the lines slowly moved over the field of vision, it very frequently happened that one or more of these particles became detached, and either moved on more slowly or more quickly than the rest. As a line descended one portion of it would sometimes move more quickly than the other, when it would break asunder, and each portion continue its independent descent. Sometimes two lines would unite where they came in contact, form a thicker line, and, if the situation of the line were somewhat vertical, form a kind of ball or globe at its lower point, evidently at the expense of the line above, which would drop off, and more rapidly fall beyond the field of vision.

Having ascertained thus much relative to the figures and colours of the muscæ, the next object was to discover whether all the bodies moved, with the same rapidity, and whether their rate of motion was modified by the state of the eye. It was immediately observed, as above stated, that the rate of motion of each body was not uniform, and that some unknown condition of the eye had a most marked influence on the rapidity of motion of the bodies at different times. At one hour of the day they would descend so rapidly, that a quarter of a minute after the eye was fixed sufficed to allow the whole to descend; while at another, after the lapse of nearly a minute, the greater portion were still visible. It was in especial remarked that when the dark lines or reticulations were chiefly seen, the motion was much less than when the other forms predominated. Generally speaking, a large body or speck was observed to move more rapidly than a small one; but it was curious to observe that, in every case where a larger body passed so near a smaller one as to touch it, if it did not unite with it, and form one body, it rolled over it laterally, so that each body was seen during all the time of conjunction in all its original dimensions. This fact showed that the bodies were not moving in a free fluid, as in that case they would, in many cases, have passed each other in the same line of vision, without touching each other, and in such a manner that the one would have obscured the view of the other. Had they been floating in a free fluid they would not have rolled over each other laterally, so that both could always be seen of their original size during all the time of conjunction, but one would have often rolled before the other, so as to render it for the moment invisible. This fact, then, which was most satisfactorily and very repeatedly ascertained, proved that these bodies were moving over the surface of some of the membranes of the eye, over some surface where the quantity of fluid or of moisture was not of sufficient depth to allow the one particle to pass the other in any direction but laterally.

These facts, then, very much circumscribe the inquiry as to the probable seat of the *muscæ volitantes*. The fact just stated of the muscæ never crossing each other in the line of vision, but always rolling over each other's edges, so as to be visible in all their circumference during the whole time, precludes the idea of their being



bodies floating in a free fluid, like the aqueous humour, or liquor Morgagni,—the place which has been assigned as their seat by Demours, Domé, Guthrie, Prevost, Bachelor, Sotteau, and many others, or in the vitreous humour, as endeavoured to be proved by Sir David Brewster. Besides this, the fact of these bodies moving with such very different rapidity at different times, and also tending towards the inner canthus of the eye, is quite inexplicable, on the supposition of their being contained in any of the fluid humours of the eye, either aqueous or vitreous, or that of Morgagni; as these fluids, so long as vision is perfect, must remain of the same quantity and density, and allow all bodies to sink in them perpendicularly.

The single circumstance of these bodies having been seen to move over the whole field of vision while the eye is fixed, (contrary to the vague negation of Dr Mackenzie and Sir David Brewster, who assert *musæ* do not move, because they did not recognize a true *musca volitans*) of itself disproves the idea of their being seated in the vitreous humour, as endeavoured to be shown by Sir David Brewster, who mistook a fixed organic speck for a *musca*.

The single circumstance of these bodies not being fixed to one spot, but really moving over the whole field of vision, precludes the idea of their depending on enlargement, dilatation, or a varicose state of the vessels of the retina or internal parts of the eye, as supposed by Pitcairn, Travers, Wardrop, &c., or on paralysed spots, or spots insensible to light, on the retina, as supposed by Buffon, Mackenzie, and others.

Where, then, is the locality of *musæ volitantes*? It must be apparent that the only place of the eye which could permit of the occurrence of phenomena such as those described must be on the conjunctival surface of the transparent cornea. If any minute body moving over this surface impinged on another, it would roll laterally over its edge, but not pass it either before or behind, so as to bring itself between the vision and the body it was passing. It is quite apparent that the small quantity of moisture on this exposed surface is never so great as to allow any minute body floating in it to pass between another body of equal volume and the membrane itself. If two bodies, then, met on this surface, the one while passing the other would never obscure it, but the two would be seen to touch and roll laterally over each other's visible edges, and either after this roll on together, or the larger mass continue its more rapid descent, and allow the other to follow more slowly. Besides, any minute body resting on this surface would occasionally exhibit a deviation from the perpendicular in its fall, in consequence of the excess of moisture on the eye tending to the inner canthus, as was occasionally observed to be the case with the *musæ volitantes*.

The fact of the external surface of the transparent cornea being the locality of the *musæ volitantes* was satisfactorily ascertained in the following manner.

The eye looking through a fine aperture in a plate of metal, or through a minute lens, was directed to the bright wall or a clear portion of the sky. It was then kept fixed steadily in one position till

the greater portion of the muscæ had descended below the middle of the axis of vision. The ball of the eye being still kept steadily fixed, the upper eyelid was brought slowly down till the obscuration by a dark body fringed with eyelashes, and marking its descent, arrived over the uppermost of the descending muscæ. The moment this was done, the body was arrested in its downward progress, and when the eyelid was allowed to elevate itself, those muscæ which it had covered were raised with it, and immediately thereafter began to redescend slowly as before. Those muscæ which were below the point to which the eyelid was allowed to descend, were not interrupted in their downward progress by the elevation of the upper ones.

When the eyelid was allowed to descend over the whole eye, and was then slowly elevated, the muscæ were seen to be elevated along with it, and scattered, as the eyelid passed over the eye, in irregular groups over the whole field of vision. Each elevation of the eyelid caused the muscæ which had fallen past the field of vision again to come within it, and then visibly redescend. Each elevation of the eyelid changed the general grouping of the muscæ. In every instance the descent of the eyelid arrested the fall of the descending muscæ, attracted them to its moist edge, elevated them along with it, allowed them to become detached during and after its elevation, and then slowly redescend.

One point of the inquiry still remained imperfect. Those who held that the bodies producing the appearance of muscæ existed in the humours of the eye, stated that the sudden motion of the eye itself was the cause of their ascent; that the motion of the eyeball agitated, as it were, the humours, and caused the particles floating in them to be dispersed through them, when their superior specific gravity caused them to redescend as soon as the eye was kept still. It was, therefore, necessary to ascertain whether motion imparted to the eyeball would re-elevate the muscæ which had fallen without receiving the aid of the eyelid.

After the eye was held fixed till the whole of the muscæ had fallen below the field of vision, the eyeball was tapped with the finger so as to agitate it, but the eyelid was kept carefully elevated. Not a single musca which had fallen was re-elevated in consequence. Occasionally a single new musca from above appeared, probably detached from the eyelid, in consequence of the motion imparted to the eye, but those which had fallen were never in consequence elevated, but their elevation was instantly caused by allowing the eyelid to close over the eye and be again elevated, as habitually takes place in winking. To ascertain the same point, after the muscæ had fallen below the field of vision, the eyelid being held fixed, the eye was first rapidly directed to the one side, and then rapidly back to its former position. If anything would have agitated the humours this would have effected it, but it produced no re-elevation of the already fallen muscæ. As, in the above experiment, a single new musca, probably detached from the edge of the upper eyelid in consequence of the motion of the ball below it, occasionally appeared,



but the shower or swarm of *muscae* which had fallen were never by this means elevated.

These very satisfactory and conclusive experiments, made by myself on my own eyes when labouring under the malady in question, seem to prove, beyond the possibility of dispute, the locality of the true *muscae volitantes*. They prove them to be situated neither in the humours of the eye nor yet in the retina or its vessels, but on the mucous surface of the transparent cornea.

Since April 1842, I have had one or two slighter attacks of the same malady, always brought on by overstraining the eyes in microscopic pursuits, during a course of severe study, and after considerable bodily fatigue; and, on each occasion, have been enabled fully to verify the above facts and conclusions. Had the specks or *muscae* existed in the humours of the eye the eyelid could not have influenced their motion. Thus, if they existed in the humours of the eye, provided the eye were kept fixed steadily in one position, the allowing the eyelid to descend over it and be again elevated, would not have imparted any motion to the humours of the eye, certainly never could have imparted such a motion as to cause particles which had descended to their bottom to be dispersed through the whole tumour. Yet, however gently the lid is lowered and elevated, the whole field of vision is found thickly scattered over with *muscae*, which slowly descend and disappear when the lid is held elevated, and do not re-appear, however much the eyeball and its humours may be moved or shaken, until the eyelid is again permitted to pass over the eyeball. Besides all this, had these bodies existed in the humours, whether in the aqueous, crystalline, or that of Morgagni, if the agitation of the eye were the cause of their elevation, we should have found them immediately after their shake floating about in every possible direction. This, however, has never yet been seen by me, and no one who accurately describes the true *muscae volitantes* pretends to describe such an appearance.

What bodies, then, exist on the surface of the transparent cornea which could give rise to the phenomena of *muscae volitantes*? In continuing my researches into the nature of the *muscae volitantes*, and studying the motes in my eyes from day to day, I found, that, though they no longer affected my vision; that, though my vision was restored as acute and clear as it is possible for vision to be, yet the *muscae* could be rendered visible whenever I wished by looking for them in the same manner as I had employed for the detection of their site and phenomena. They, however, no longer appeared as dark specks marring vision, but as bright transparent bodies, round or globular, which fell like strings or showers of pearls on elevating the eyelid. As I had been examining the bodies from day to day I could not be mistaken as to the objects which I now saw, being the very same as those which had given me so much annoyance when they troubled my vision as *muscae*. What, then, were these bodies?

As I found, they existed in the healthy as well as in the diseased eye,—a fact noticed by Prevost so early as 1832, and confirmed by

the observations of Donné, Bachelor, Jurin, Sotteau, &c., it appeared to be the mode least liable to fallacy, to procure a few eyes, and examine the external surface of the cornea under a powerful microscope. When this was done with a recent eye I was delighted to find the whole surface scattered over with the mote-like bodies, which I instantly recognized to be nothing else than globules of mucus. I made use of this pleasant discovery to repeat, under the microscope, the observations I had formerly made with my own eyes. The microscope was fixed horizontally, so as to have the surface of the cornea vertical. A portion of the mucous lining of the eyelid was then moistened with water and passed rapidly over the surface of the cornea, below the microscope, when instantly the whole particles of mucus began slowly to descend, as I had seen them do in my own eye. The rapid evaporation of the moisture soon put a stop to their motion, which, however, was renewed on a fresh application of the moistened eyelid.

The varied colours which these bodies presented to the living eye, when affected by muscæ, were easily imitated on the surface of the cornea in the dead eye by throwing the light in various directions over the cornea under examination. According to the direction of the transmitted or reflected light the bodies were clear or dark, had bright or dark centres, bright or dark circumferences, or were illuminated strongly on one side, so as to resemble sparks, &c.; when several globules of mucus lay in a line they, in certain lights, looked like a string of pearls. In fact, every appearance seen in the living eye was witnessed on the surface of the cornea under the microscope.

On one occasion, from inattention, a dry eyelid was wiped over the surface of the cornea, below the microscope, and nothing could have proved more satisfactorily the truth of the conclusions above arrived at; for, in this case, instead of the globules of mucus being scattered irregularly over the surface, they were almost all drawn, or rather wiped, into fine streaked lines,—the exact appearance which my own eyes had presented in some particular states for which I could not then account. This fact, however, at once served to explain what I wanted. I had remarked that, when the lines were most numerous, their movement was much slower than that of the detached muscæ. The eye must therefore have been drier, and the deficiency of moisture both caused the lubricating mucus to be wiped by the eyelid into fine streaks, and left that mucus too little moisture to allow it to spread equally or more freely over the eye.

During last winter I had an opportunity of investigating this point more minutely. After making a number of different experiments with my eyes, when affected with muscæ, they got so fatigued as to become very painful, dry, and heated. The vision too got so obscured by the appearance of lines or reticulations that I could with difficulty distinguish objects. In the best manner I was able I examined the surface of the eye. There was a decided lack of moisture. In this respect, then, it perfectly imitated the cornea below the microscope, and the dry eyelid wiping over it swept the tough mucus into the fine streaks or lines which interrupted vision.



It instantly struck me that, if I could produce a flow of tears, it would prove or refute the truth of the theory I had formed. If the stream of tears converted the lines and threads into loose floating muscæ my point was proved; if not, I must seek for some other explanation. A very pungent snuff was therefore taken, the eye covered with its lines and threads was fixed in the proper position. I had just time to see they were there when a gush of tears swept over the eye, and floated off every line and thread as detached separate rounded muscæ; indeed, so effectual were the tears in removing the obstructions to vision that, so long as the eye remained suffused with moisture, I was scarcely annoyed by the muscæ, and when they did appear before the eye they passed over it so rapidly as scarcely to interrupt vision. Some days, however, elapsed before I perfectly recovered from this attack.

In order to furnish the most perfect evidence which it was possible to obtain relative to these bodies, it may be remarked that I have examined by the microscope the humours of the eye, with the view of ascertaining whether there were any bodies floating in them which could produce the phenomena of muscæ. I have never succeeded in detecting any.

These facts, then, serve to prove that *muscæ volitantes* are nothing else than the globules of mucus which lubricate the external or mucous surface of the transparent cornea. These globules are only rendered visible when the retina, or expansion of the visual nerve, is in an irritable state; and that it is so in all those cases in which this phenomenon is observed, is well known to every medical practitioner. It is, besides, a matter of common observation that the eye labouring under this malady feels uneasy and heated, and is unusually dry. This state would, therefore, render the mucous secretion more viscous than usual, so that the globules of mucus, instead of floating freely over the eye, would be wiped by the eyelid, and motion of the eyeball on the lid, into irregular wavy or zigzag lines or reticulations, and give rise to that appearance so often described as a net-work or cobweb before the eyes, (*visus reticulatus*.) The irritability of the retina is known to be induced by a great many causes. Two opposite states of the circulation will increase its irritability, viz. that of congestion from an overflow of blood to the part, or semistagnation of the circulating fluid in its vessels from want of tonic power to propel it. This is the reason why *muscæ volitantes* are not only seen in almost all affections of the retina, as in incipient amaurosis, retinitis, &c., but are also of very common occurrence in all dyspeptic complaints, the low stages of fever, &c. It is the circumstance of this malady generally attending the first stage of amaurosis,—a disease commonly leading to the loss of sight, which has made their occurrence be so much dreaded by all. It is the circumstance of so many practitioners confounding these moving muscæ with the fixed specks which depend on organic changes in the eye, (whether these arise from partial opacities in the humours, or their enveloping membranes, or depend on certain spots of the retina having lost their sensibility,) which has so often led them astray as to the cause



of their production, and induced them to regard their presence as an indication of the existence of some serious disease of the eye.

By attending to the characters laid down above no doubt can ever arise as to the true nature of the bodies which are met with in the eye, and disturb vision. Where *muscæ volitantes* are found uncomplicated with fixed specks, nebulae, or indistinct troubled vision, we can always satisfy the patient as to the innocuousness of the malady under which he labours, and free his mind from any anxiety as to his losing his sight. The diagnosis of the malady, then, is of no mean importance in practice; for though the complaint is of itself simply annoying and unattended with danger to the sight, it is so often also an attendant on those affections which lead to the destruction of vision, that every means ought to be used to discover its true nature. If, with the moving harmless muscæ, threads, lines, reticulations, or showers of fire, there be fixed specks in the eye, deep-seated pain, clouded or mottled vision, and the other more ordinary symptoms of amaurosis or affection of the retina, it is high time that the most active remedies be employed, as the total loss of vision is threatened. But if these are wanting, and it be ascertained that the muscæ exist alone, general treatment is all that is usually required to restore the vision to its accustomed clearness. It is worthy of remark, however, that when once *muscæ volitantes* have appeared in the eye, they are scarcely ever got entirely rid of. Whether this depends on the eye becoming morbidly sensible to the globules of mucus moving over its corneal surface, or to the person attending more to the presence of such bodies and looking for them, or that the system once thrown into the condition which favours the appearance of these muscæ, is easily affected in a similar manner, has not yet been accurately ascertained. Certain it is that, in the eyes of those once affected with muscæ, even a trifling cause will produce their reappearance. A fit of indigestion, derangement of the bowels, overstraining of the eyes, &c. will, again and again, cause the reappearance of these troublesome visitors, and from these causes they may be seen at intervals, during the whole course of a long life, without permanently injuring vision.

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